

AMENDMENTS TO THE CLAIMS

This listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims:

1. (Previously Presented) A magnetic sensor comprising:

a plurality of sense layers, including a ferromagnetic pinned layer that has a magnetization that is stable in response to an applied magnetic field, a soft magnetic free layer that has a magnetization that rotates in response to the applied magnetic field, and a nonferromagnetic spacer layer that separates the pinned layer from the free layer, the free layer extending between two ends in a track-width direction; and

a ferromagnetic bias layer structure that is separated from the free layer by an electrically conductive nonmagnetic spacer layer, the bias layer structure having a first section extending between two edges in the track-width direction such that the ends of the free layer are magnetically coupled to the edges of the first section, the bias layer structure having a second section that is separated from the electrically conductive spacer layer by the first section, the second section extending at least twice as far as the first section in the track-width direction.

2. (Original) The sensor of claim 1, further comprising a soft magnetic shield that is disposed adjacent to a first of the ends, such that a line that intersects the ends and is parallel to the track-width direction intersects the shield.

3. (Original) The sensor of claim 2, wherein the shield is separated from the first end by a nonferromagnetic insulating layer.

4. (Original) The sensor of claim 1, further comprising a soft magnetic shield that is disposed adjacent to both of the ends, such that a line that intersects the ends and is parallel to the track-width direction intersects the shield adjacent to each of the ends.

5. (Original) The sensor of claim 1, wherein the first section is a first magnetic layer and the second section is a second magnetic layer.
6. (Original) The sensor of claim 1, further comprising a soft magnetic shield that is separated from the bias layer structure by a nonferromagnetic layer.
7. (Original) The sensor of claim 1, wherein the nonferromagnetic spacer layer is electrically conductive.
8. (Original) The sensor of claim 1, wherein the nonferromagnetic spacer layer includes a plurality of heterogeneous materials.
9. (Original) The sensor of claim 1, wherein the nonferromagnetic spacer layer is made of dielectric material.
10. (Original) The sensor of claim 1, further comprising an antiferromagnetic structure that is magnetically coupled to the pinned layer.
11. (Original) The sensor of claim 1, wherein the pinned layer is a first part of a pinning structure, the pinning structure including a second part that is made of hard magnetic material that extends at least twice as far as the pinned layer extends in a stripe-height direction that is perpendicular to the track-width direction.
12. – 39. (Canceled)